A Population of *Taphromysis louisianae* (Banner); (Crustacea: Mysidae) in a Clermont County Ohio River Wetland[1]

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ABSTRACT. A reproducing population of *Taphromysis louisianae* was found in a shallow freshwater tributary of the Ohio River in Clermont County, OH throughout 1990-91. The nearest distribution record is in Louisiana. Therefore, this is the first record of this normally brackish water species in the Ohio River Basin. Analysis of habitat reveals that the population prefers shallow water (<1 m) with leafy, high organic matter (about 8% of the soil dry weight) substrate. At the Ohio discovery site salinity was below limits of detection; the average pH was 6.5, and the mean dissolved oxygen concentration was 10 mg l^{-1}. This is in contrast to the higher salinity habitat of this species in bays and ditches of tidal areas. Because of distance and physiochemical disparities between the Gulf Coast and Ohio habitats, it is suggested that the isolated inland population exhibits characteristics of the early stages of speciation.

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INTRODUCTION

Taphromysis louisianae Banner, 1953, was found in February 1990 during a study on spatial and temporal distributions of wetland benthic macroinvertebrates in the Ohio River basin . This is the first documented occurrence of the brackish water mysid in the Ohio River basin since *T. louisianae* has been reported previously only from coastal areas adjacent to the Gulf of Mexico. This Ohio River basin record represents a northern range extension. Our purpose is to determine if this occurrence is an anomaly, or if *T. louisianae* is an annual resident. Further, since this is a new habitat for the species, we sought to investigate habitat characteristics.

MATERIALS AND METHODS

Site Description

Collecting was done in Crooked Run State Nature Preserve, a 31 ha wetland in Clermont County, OH, adjacent to the Ohio River at river mile 434 (Fig. 1). This shallow wetland is dominated by a planktonic community with little emergent vegetation, except in the northeast embayment. The water level is controlled by an inflowing stream, Crooked Run, and the fluctuating water levels of the Ohio River. Activity at the Captain A. Meldahl Locks and Dam downstream creates strong daily inflows and outflows of water in the study site. Because this flooded stream mouth lies in a semi-enclosed basin, and is hydrologically influenced by the Ohio River, the Ohio Department of Natural Resources refers to this wetland as an estuary (ODNR 1987). Generally, constant depths along the northern side of the wetland produce shallow flats (water depth averaging about 0.75 m), although some steep bank areas along the south edge are 1.0 to 2.5 m deep.

Collection

Ten sample stations were chosen along a hydrologic gradient for benthic macroinvertebrate collecting (Fig. 1). Water quality parameters such as depth (meter stick or lead line), pH (portable meter), dissolved oxygen (YSI model 54 D.O. meter), and temperature and conductivity (YSI model 33 S-C-T meter) were determined at each site. Sediments were analyzed for particle size using the Bouyoucos hydrometer method (Brady 1990), and for percentage of organic matter based on loss on ignition at 550° C (Dean 1974).

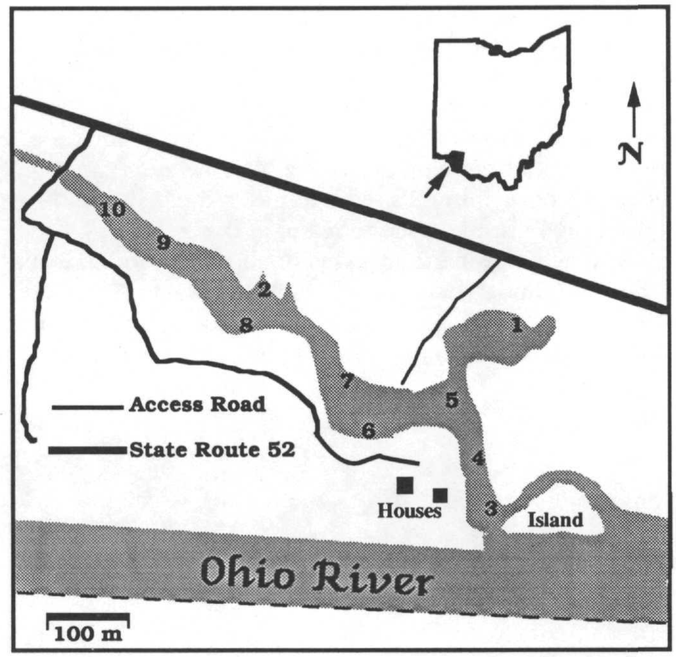

FIGURE 1. Location of Crooked Run wetland showing sampling areas.

To assess which species were annual residents, benthic samples were taken each season from February 1990 to February 1991. A 225 cm^2 Ekman dredge was used for quantitative analysis of benthos. Additionally, dip nets (1.0 mm mesh) were used to capture more mobile organisms. Dip net samples were collected by dragging the net over the top layer of the substrate while wading. Samples were stored in formalin in the field, then taken to the laboratory and sorted into taxonomic groups. After sorting, specimens were stored in 95% ethanol. Mysid

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shrimp collected in dip nets were identified as *Taphromysis louisianae* Banner, 1953 using keys prepared by Banner (1953), Stuck et al. (1979), and Pennak (1989). This identification was verified by R. W. Heard of the Gulf Coast Research Lab.

RESULTS

Specimens of *T. louisianae*, were collected in dip nets during every sampling event. No specimens were found in Ekman dredge samples. In February 1990, 14 female and 13 male specimens of synchronous age were collected. Nine specimens of synchronous age were collected in April 1990; more than 20 specimens of varying age classes were collected in November 1990.

Collections made in February 1991 were taken in a wider range of depths and areas of the wetland to investigate spatial patterns. Substratum conditions are similar for each station (Table 1). The substratum was largely sand and organic detritus (usually a layer of leaves covered the sediment surface). Scattered stumps, logs, and fallen trees were also found upon this anaerobic mud. Station 4 was situated near a deep bank and the substratum had a greater clay content. Twenty specimens were collected over the area of the shallow flats; 9 from deep bank area; 7 in the northeast embayment; and none near the Ohio River. Generally, mysids were found in areas where there was a high organic matter content in the sediments.

Water quality in the area was similar to that found in the Ohio River and the inflowing streams in this area. Therefore, the dissolved ion concentration was orders of magnitude lower than the average for a brackish area: the average conductivity was 300 μmhos cm^{-1}; salinity was below limits of detection. Dissolved oxygen was high in surface waters, but low near the sediments (Table 1).

DISCUSSION

Specimens of *T. louisianae*, including both sexes and various size classes, were collected each season for one full year within the Ohio wetland. The group of mysids in the study site represents a resident population, and a northward range extension of approximately 1,000 km. Current records indicate a disjunct distribution from the Gulf of Mexico to the Ohio River wetland, hence our record would appear to be a geographical isolate, or a peripheral population of the populations found in the Gulf of Mexico.

Much of the research dealing with wetland macroinvertebrates has been concerned largely with fauna in northern or coastal areas (Crow and MacDonald 1979). There is a paucity of data on abundance, distribution, and ecology for macroinvertebrates in freshwater wetlands in the interior United States. Studies that have been done are usually ancillary to waterfowl management studies (for example, Murkin and Kadlec 1986, Riley and Bookhout 1991). Because wetlands are ecotones that exist between aquatic and terrestrial systems, the species assemblages may be uniquely adapted to these areas and their associated stresses, such as anoxia and desiccation (Sklar 1985). The importance of wetland habitats as refuges for unique and/ or fugitive species of macroinvertebrates is not well known.

Our data indicate that this species is usually found around substratum that has a high content of organic matter, and that it resides in the shallower (>0.75 m)

TABLE 1

Comparison of habitats where T. louisianae *has been collected.*

Location	Dissolved Oxygen mg/l	Conductivity μmhos/cm	Salinity g/l	Water Temp.	Depth m	Substratum	Reference
Vermillion Parish, LA	–	–	0	–	0.7 - 0.9	mud, no emergent vegetation	Banner (1953)
East Bay, FL	7.3 - 11.1	–	0	14 - 30	< 1.0	–	Sheridan and Lewis (1981)
Blackwater River, FL	–	–	1 - 2	13 - 21	–	mud, detritus, algae, sand, emergent vegetation	Hamaker and Matthews (1979)
Cedar Point, MS	–	–	–	–	–	silty sand	Stuck et al. (1979)
Alligator Lake, TX	–	–	0 - 22	7 - 30	–	–	Conte and Parker (1971)
Oyster Lake, TX	–	–	9 - 26	12 - 31	–	–	Conte (1972)
Cedar Bayou and Galveston Bay, TX	1.0 - 8.8	2000 - 6700	0.1 - 28	14 - 26	< 1 - 5	–	Kalke (1972)
Crooked Run, OH	12.8	330	0	5 - 22	0.2 - 1	silty clay, about 10% organic matter, leaves	

reaches of the marsh. This may be the result of an association with the abundant microbial and protozoan populations found in these areas. Such a notion is consistent with its habitat preference in coastal areas (Table 1). Since no specimens were collected in deeper waters, or near the mouth at the Ohio River, we assume that high water velocities or lack of food kept this highly mobile species from moving into deeper waters. Although this mysid occurs in a wide range of salinities (0 g l^{-1} to 28 g l^{-1}), it occurs in greater abundances in waters of low salinity (Conte 1972, Conte and Parker 1971). The increased abundance in low salinity may result from preference, from the conveyance of competitive advantage, or from physiological limitations.

Because *T. louisianae* is adaptable in marginal habitats, we propose that this mysid may have used the Mississippi River corridor to enter the Ohio River Basin. The record presented here represents a discontinuous distribution, but we suggest that further study in these two major rivers may produce additional records. Our searches in backwaters in Henderson County and Union County, KY have yielded no mysids. However, subsequent to this study, an additional collection of *T. louisianae* was made along the Ohio River in Boone County, KY (G. L. DeMoss pers. comm.).

It is surprising that a crustacean endemic to the southern U.S. is able to tolerate both the colder climates and freshwater of southern Ohio and the warmer climates and saltwater in the Gulf of Mexico. Adaptations to the northern climate and environment undoubtedly exist. We suggest that this mysid may currently be speciating from southern populations in coastal areas. The occurrence of other populations of *T. louisianae* in shallow banks or backwaters of the Ohio River and Mississippi River may indicate a continuous distribution, rather than a stage of speciation. To address this question, future research is required regarding morphological, biochemical, and genetic differences between individuals from both areas.

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